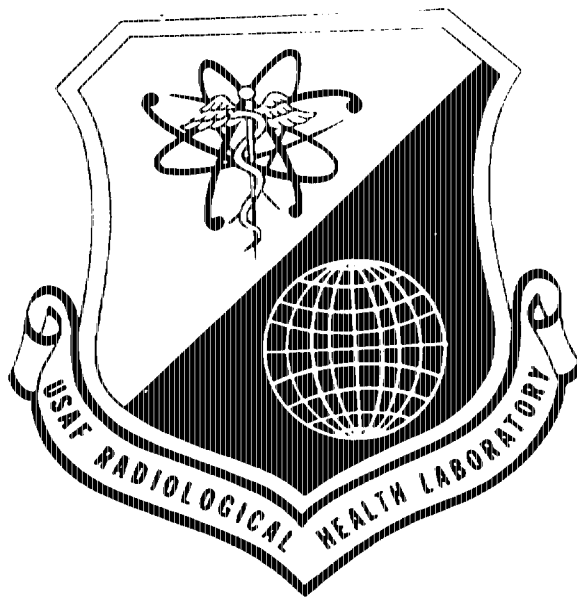


*Taschner*

DEPARTMENT OF THE AIR FORCE  
AIR FORCE LOGISTICS COMMAND  
WRIGHT-PATTERSON AFB, OHIO  
FIRST ANNUAL MEETING  
27-28 Oct 1966

# PLUTONIUM DEPOSITION REGISTRY BOARD



MAJ. JOHN C. TASCHNER

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## GENERAL INFORMATION

Time and Place of Meeting: 0830 hours, 27 Oct 66, Room B-98, USAF Hospital (basement), Wright-Patterson AFB. This is within easy walking distance of your quarters.

Quarters: Reservations for each attendee have been made at the Visiting Officer's Quarters (Bldgs 825 or 826) on the base.

### Transportation:

On Base: Available by calling the Motor Pool at 76518.

Between the hours of 1700-2200 a shuttle-bus operates every 10 minutes between the billeting office and the Officer's Club.

Off-Base: Services of commercial taxi firms are available.

Air Transportation--Military: For those arriving from and returning to the Washington DC area, a C-131 operates daily, except Saturday, between Wright-Patterson and Andrews.

#### Schedule:

Depart	Wright-Patterson	1300
Arrive	Andrews	1500
Depart	Andrews	1600
Arrive	Wright-Patterson	1800

Show time is one hour prior to departure, and reservations should be confirmed 2-3 days prior to travel.

Commercial--Cox Municipal Airport serves Dayton, and flights are operated by United, Delta, TWA, American and Lake Central Airlines. An Air Force bus operates from the billeting office to the airport daily. Schedule:

Departure times (EST): 0640, 0740, 0845, 1100, 1155, 1255, 1405, 1515, 1610, 1710, 1815, 1910, 2015, 2120.

One-way trip takes about 30 minutes.

Messing Facilities: Breakfast may be taken in the Fairchild Mess (top floor of Bldg 826). The noon meal on 27 Oct 66 will be available at the Hospital Dining Room. Evening meals may be taken at the Officer's Club.

Emergency Telephone Numbers: During the conference you may be reached at 513-257-2577. The number of your billeting office is 513-257-0641. During the evenings, if you need assistance, call LtCol L. T. Odland at 256-3105, or your escort officer.

## CONFEREES

### PLUTONIUM DEPOSITION REGISTRY BOARD

#### GUEST SPEAKER

BrigGen John M. Talbot, MC, USAF  
Special Assistant to The Surgeon General for Medical Research  
Hq USAF, Wash DC

#### MEMBERS

Chairman	Col Louis B. Arnoldi, MC, USAF Command Surgeon, Hq AFLC Wright-Patterson AFB Ohio
Civilian	W. D. Norwood, M. D. Pacific Northwest Laboratory Richland, Wash  W. H. Langham, PhD. Los Alamos Scientific Laboratory Los Alamos NMex
U. S. Navy	Capt J. Schulte, MC Bureau of Medicine and Surgery Wash DC
U. S. Army	LtCol William E. Froemming, MC Occupational Medicine Consultant Preventive Medicine Division Wash DC
U. S. Air Force	Col J. A. Hennessen, MC, USAF Commander, USAF Hospital Wright-Patterson AFB Ohio  LtCol L. T. Odland, MC, USAF Commander, USAF Radl Health Lab Wright-Patterson AFB Ohio

## CONSULTANTS TO THE BOARD

### U. S. Veterans Administration Medical Department

M. A. Quaife, M. D.  
Chief, Special Laboratory of Nuclear Medicine and Radiation  
Biology  
Veterans Administration Hospital  
Omaha, Nebraska

### U. S. Army Medical Service

LtCol Kent T. Woodward, MC  
Director, Division of Nuclear Medicine  
Walter Reed Army Institute of Research  
Walter Reed Army Medical Center  
Wash DC

### U. S. Navy Medical Service

Capt R. K. Skow, MSC  
Radiation Safety Officer  
National Naval Medical Center  
Bethesda, Md

### U. S. Air Force Medical Service

LtCol Dale R. Lindall, MC, USAF  
Chief, Bionucleonics  
Office of the Surgeon General  
Hq USAF, Wash DC

Maj John McBain, MC, USAF  
Department of Medicine  
USAF Hospital, Wright-Patterson AFB Ohio

### Office of the Inspector General

Capt J. Pizzuto, BSC, USAF  
Office of the Director of Nuclear Safety  
Kirtland AFB NMex

W. Johnson, Ph.D.  
Office of the Director of Nuclear Safety  
Kirtland AFB NMex

U. S. Atomic Energy Commission

Gordon Dunning, Ph.D.  
Deputy Director  
Division of Operational Safety  
Germantown Md

Defense Atomic Support Agency

Col Gerrit L. Hekhuis, MC, USAF  
Chief, Medical Division  
Wash DC

Monsanto Research Corporation

Mr. Warren E. Sheehan  
Health Physics Department  
Mound Laboratory  
Miamisburg Ohio

## ESCORT OFFICERS

### Scientist

W. Langham, Ph.D.

W. Norwood, M. D.

Capt R. Skow, USN

Dr. Gordon Dunning, AEC

LtCol W. Froemming, USA

### Escort Officer

LtCol Richard E. Benson  
Deputy Commander  
USAF Radl Health Lab  
Telephone: Office Ext 76672  
Quarters Ext 76355

M. A. Quaife, M. D.  
Chief, Spec Lab of Nuc Med & Biorad  
VA Hospital, Omaha, Nebr

LtCol Lawrence T. Odland  
Commander  
USAF Radl Health Lab  
Telephone: Office Ext 76672  
Quarters 256-3105

Maj John C. Taschner  
Chief, Chemistry Services Br  
USAF Radl Health Lab  
Telephone: Office Ext 76672  
Quarters 236-0042

Capt Ronald G. Conrad  
Chief, Special Activities Br  
USAF Radl Health Lab  
Telephone: Office Ext 76672  
Quarters 878-9067

Capt George S. Kush  
Chief, Dosimetry Sec  
USAF Radl Health Lab  
Telephone: Office Ext 76672  
Quarters 233-8027

## PLUTONIUM DEPOSITION REGISTRY BOARD

Wednesday, 26 Oct 1966

Thursday, 27 Oct 1966

Introduction of BrigGen Talbot ---- Col L. Arnoldi

Formal presentations will discuss the  
Palomares Spain Incident and Bio-Assay  
Program

0855      Field Operations ----- Capt J. Pizzuto

0915 Sample Control, Data Processing and  
Storage at USAF Radl Health Lab -- Lt H. Kaufman

0930 Analytical Chemistry Methods Used in  
Processing Samples ----- Maj J. Taschner

0950            Radioactive Counting Procedures -- Capt R. Thomas

1005                      Results of Analyses ----- LtCol L. Odland

1030           Comments from Conferees and  
Consideration of Future Actions --- LtCol L. Odland,  
Moderator

1215 Lunch -- USAF Hospital Dining Room

1315 Reconvene -- Continue discussions

1620                      Adjourn

Evening hours

Open--Conferees may select whatever diversionary activities desired.

Friday, 28 Oct 1966

If all discussions have been completed on 27 Oct 66, conferees are invited to visit the USAF Radl Health Lab, Bldg 1405, Area A. Bus transportation will be provided, departing billeting office at 0830 hours.

1200

Conference terminated

Return to billets, check out and depart

If a need for further discussions on 28 Oct 66 is agreed to by Board Members, the conference will reconvene in Room B-98 at 0830.

## THE INCIDENT

On 17 Jan 1966 a B-52 bomber and KC-135 tanker aircraft collided in flight over or near Spanish territory. The resulting impact permitted the uncontrolled dispersion of four nuclear weapons, three of which fell on Spanish soil and one in the Mediterranean Sea.

Immediate search operations located the three devices on the ground and verified that the integrity of two was destroyed. High winds permitted dispersal of 239-plutonium over a wide area.

Because the whereabouts of the fourth weapon remained a matter for speculation, a large-scale search operation continued on land and sea until 26 Mar 66, when it was removed from the sea. Nearly 2000 American personnel participated in the search, and many Spanish Nationals were also involved. During this period the 239-plutonium constituted an inhalation hazard, even though precautions were taken to prevent gross exposures.

Before completion of the task, several tons of topsoil were collected, sealed in barrels, and removed to a national nuclear burial ground in the United States.

## SAMPLE CONTROL SYSTEM

The sample control system permitted the laboratory to keep accurate records on all samples received for analysis. In addition, it provided a simple, fast, method of recalling data for report generation and statistical analysis. The combined resources of the punch-card equipment and the Mathatron desk calculator located in the laboratory, and the IBM 7094 DCS located at Aeronautical Systems Division, gives this laboratory a formidable data-processing capability that should be able to meet any requirement placed on it by the Plutonium Deposition Registry Board.

## ANALYTICAL PROCEDURES

Initial urine samples from personnel involved in the Palomares search and recovery operation were processed, using a gross alpha screening procedure. The steps in this procedure were:

- (1) wet ashing of an aliquot of the urine sample with concentrated nitric acid and hydrogen-peroxide to a white ash;
- (2) solubilizing the white ash and coprecipitation of plutonium with bismuth salts;
- (3) dissolution with hydrochloric acid followed by the addition of lanthanum carrier before hydrofluoric acid precipitation;
- (4) direct mounting of the precipitate on a 2" steel planchet; and,
- (5) counting for 120 minutes in an internal proportional counter.

Plutonium<sup>239</sup> spiked pooled urine samples were processed in a like manner to obtain quality control data. Plutonium recoveries of  $75.6 \pm 19.6$  percent (68% confidence) were obtained.

Because of field contamination of initial samples, a resampling program was initiated 2-3 months after the personnel returned to their home base. A procedure which is specific for plutonium was adopted for the resample urines. One-half of the total urine sample was adjusted to pH 2 with concentrated nitric acid. A plutonium<sup>238</sup> internal tracer was added to each sample for quality control. The sample was then heated to boiling to break any metabolic complex-binding plutonium. The plutonium was coprecipitated with the alkaline earth phosphates by adjusting the urine sample to pH 10 with concentrated ammonium-hydroxide. The salts were dissolved in nitric acid and coprecipitated with radiochemically-pure cerium by adjusting to pH 4.5. This precipitate was dissolved in hydrochloric acid and passed through an anion-exchange column which adsorbs the plutonium. Interfering anions adsorbed on the column were removed by washing with hydrochloric acid. Hydriodic acid was used to elute the plutonium from the ion-exchange column. The plutonium was changed to the sulfate salt by heating the evaporated column residue in sulfuric acid. The solution was adjusted to approximately pH 3 and electroplated on a one-half inch steel planchet. A solid state alpha spectrometer was used to measure the plutonium alpha activity present. Plutonium recoveries of  $75.7 \pm 16.2$  percent (68% confidence) were obtained.

## COUNTING PROCEDURES FOR Pu<sup>239</sup> IN URINE

### I. Counting Procedures Used for Initial Samples:

Samples were counted, using Nuclear Measurement Corporation PC-3A, windowless, gas-flow proportional counters. Daily checks were made on instrument performance by counting reference standards of Pu-239, to insure constancy of counting efficiency. Samples were counted for 120 minutes and backgrounds were counted daily, normally for 960 minutes. The daily background counts also served as checks on contamination; the counting chambers were decontaminated when background became greater than 0.1 count per minute. Normal backgrounds ranged from 0.02-0.06 count per minute.

Sample activity was calculated from the following expression:

$$\text{pCi/sample} = \frac{(\text{gross counts/gross counting time}) - (\text{bkg counts/bkg ctg time})}{(\text{counting efficiency})(2.22)(\text{procedural yield})}$$

### II. Counting Procedures Used for Resamples:

The detectors were solid state surface barrier types mounted in a vacuum chamber. Charge sensitive preamplifiers, designed and built by Mr. Robert L. Farr of the laboratory staff, were used to amplify signals from the detector. Output from the preamplifiers was fed to a Nuclear Data 130 AT multichannel analyzer. Readout from the analyzer was in the form of typewriter printout.

Using an electroplated source containing known activities of Pu<sup>239</sup> and Pu<sup>236</sup>, instrument performance was checked each morning before beginning counting, and, normally, an additional time each afternoon. The performance check consisted of observing the peak channels for Pu<sup>239</sup> and Pu<sup>236</sup>, and adjusting the gain of the amplifier system, if necessary, to correct for any gain shifts. Additionally, the counting efficiency of the system was checked at the same time, to insure constancy.

Background counts were made each night for 800 minutes' duration, with a blank planchet in the counting chamber. The daily background count also served as a check for any possible contamination in the counting chamber. Samples were routinely counted for 100 minutes.

The data was collected in an analyzer memory of 255 storage positions. Total counts in two bands, centered on the peak channels of  $\text{Pu}^{239}$  and  $\text{Pu}^{238}$ , and each containing 11 storage locations, were totaled and used for the sample activity calculations. The same bands were used for both sample and background determinations. Sample activity was calculated from the following expression:

$$\text{pCi/sample} = \frac{(\text{net cpm in Pu}^{239} \text{ band}) \times (\text{dpm Pu}^{238} \text{ added})}{(\text{net cpm in Pu}^{238} \text{ band} \times (2.22))}$$

$$\text{where net cpm in Pu}^{239} \text{ band} = \left[ \frac{\text{gross cts Pu}^{239} \text{ band}}{\text{gross ctg time}} - \frac{\text{bkg cts in Pu}^{239} \text{ band}}{\text{bkg ctg time}} \right]$$

$$\text{net cpm in Pu-236 band} = \left[ \frac{\text{gross cts Pu}^{239} \text{ band}}{\text{gross ctg time}} - \frac{\text{bkg cts Pu}^{238} \text{ band}}{\text{bkg ctg time}} \right]$$

$$\text{dpm Pu}^{238} \text{ added} = \text{activity of Pu}^{238} \text{ spike added to sample corrected for decay to date of count.}$$

2 2 2  $\frac{\text{cpm}}{\text{pcu}}$

## RESULTS

### Initial Urine Samples -- Alpha Activity

	<u>Air Force</u>	<u>Army</u>	<u>Navy</u>	<u>Other</u>	<u>Total</u>
Number Analyzed	1389	107	37	38	1571
BB* greater 100% **	19 (0)	1 (0)	0	0	20
BB 0.99 to 0.09 <sup>xxx</sup>	361	33	5	8	407
BB 0.09 to 0.009	487	23	20	7	537
BB less than 0.009	522	50	12	23	607

\* Body Burden -- calculated on the basis of urinary excretion

according to expression  $D = 435 U t^{0.76}$

where D = body burden (systemic)

U =  $Pu^{239}$  activity in 24-hour sample

t = time in days from exposure to sampling

\*\* Value of  $0.044 \mu c Pu^{239}$  for D represents one body burden or 100%

<sup>xxx</sup> Approximately 80% of this group was resampled, and results will be presented at the meeting.

# RESULTS

## Miscellaneous Type Samples

### Water

40 analyzed

7 no detectable activity

33 range of 0.1 to 633 pCi/liter

median value of 1.64 pCi/liter

### Vegetation Swipes

78 counted

63 no detectable activity

13 range of 0.1 to 4.3 pCi

median value of 0.6 pCi

### Nasal Swipes

120 counted

70 no detectable activity

50 range of 1.0 to 337 dpm

mean 24.4, S.D. 48.0, median 13 dpm

### Soil

23 samples -- gamma scan

peaks at 60, 27, 16, 110, 185 Kev

### Vegetation

Samples too active for processing

## ITEMS FOR GENERAL DISCUSSION

1. Should continued efforts be made to secure initial and/or repeat samples on all personnel who have not been tested but who were in the area?  
*go for these*
2. Does the board recommend resampling of individuals whose initial urine samples showed less than 9% of one body burden? *No*
3. At what level of body burden, if any, obtained on resampling, does the board recommend continued follow-up? What should be the nature and frequency of such follow-up, if recommended?  
*take those with BB from 1-10% total 172 take 10% of highest.*
4. Should whole-body counting techniques be developed by the U. S. Air Force for detection of 239-plutonium-241 americium as an additional tool in the event of future similar incidents? If affirmative, what type of hardware is recommended?
5. By using ratios of 239-plutonium to 241-americium in the weapon, soil, and urine, is it possible to determine the 239-Pu content of the lungs using 241-americium values determined by whole-body counting techniques?

<sup>239</sup>Pu  
92